# 5700A/5720A

## Series II Multi-Function Calibrator

## Remote Programming Reference Guide

FLUKE®

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## Series II Multi-Function Calibrator

## Remote Programming Reference Guide

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### *Syntax Rules*

| | |
|---|---|
| Spaces | Use at least one space between a command and a parameter. Do not use spaces within a parameter, or within a number. |
| Multiple Parameters | When a command has more than one parameter, separate the parameters with commas. For example: "OUT 1 V, 100 HZ". |
| Numeric Parameters | Parameters may have up to 255 significant figures. Exponents may range from -32000 to +32000. The useful range for 5720A programming is ± 2.2 E-308 to ± 1.8 E308. |
| Case Sensitivity | All lower case letters are converted to upper case except in quoted strings. |
| Extra Parameters | Avoid using extra parameters. Too many parameters will cause a command error. |
| Null Parameters | Null parameters will cause a command error (e.g., adjacent commas in "CLOCK 133700, ,071787"). |
| Expressions | Do not use expressions as parameters. An example of an expression is "(4+2*13)". |
| Units | Accepted units in command parameters are:<br>A amperes<br>DB decibels<br>DBM decibels references to 1 milliwatt for ac voltage amplitude<br>HZ hertz<br>OHM ohms<br>PCT percent<br>PPM parts per million<br>V volts |

## *Syntax Rules (continued)*

| | |
|---|---|
| Multipliers | MA mega, or unit x 1,000,000)<br>K kilo, or unit x 1,000)<br>M milli, or unit ÷ 1,000;<br>(except MOHM and MHZ)<br>U micro, or unit ÷ 1,000,000)<br><br>Examples:<br><br>MOHM or MAOHM Megohms<br>MHZ or MAHZ Megahertz<br>MV millivolts<br>MAV Megavolts<br>MA millliamperes |
| Multiple Commands | To combine commands in one statement, use a semicolon (;). For example, instead of using these two statements:<br><br>20 PRINT @3,"OUT 100 MV" ! Select 100 mV dc<br><br>30 PRINT @3,"OPER" ! Activate the output<br><br>You can accomplish the same with this single line:<br><br>20 PRINT @3,"OUT 100 MV ; OPER" |
| Terminators | Terminators sent by the 5720A: LF with EOI.<br>Terminators received by the 5720A: LF or any character with EOI |
| Responses | The responses described in the command table are correct for IEEE-488 remote control, and for serial remote control in "COMPUTER" mode. In serial remote control in "TERMINAL" mode, responses contain more descriptive text intended for an operator using a terminal interactively. |

## *Command Summary by Function*

| Error Mode Commands | |
|---|---|
| ADJOUT? | Returns adjusted output magnitude and frequency. |
| INCR | Increments or decrements the output |
| MULT | Multiplies reference by a value and establishes the product as a new reference. |
| NEWREF | Establishes a new reference. |
| OFFSET | Sets and enables or disables an offset. |
| OFFSET? | Returns the value of the present offset. |
| OLDREF | Sets the output to the present reference. |
| OUT_ERR? | Returns the UUT error computed by the 5720A. |
| REFOUT? | Returns the value of the present reference. |
| SCALE | Activates and deactivates scaling. |
| SCALE? | Returns scaling information. |
| SCAL_ERR? | Returns the scale error value if scaling is active. |
| **Instrument Configuration Commands** | |
| BTYPE | Selects an amplifier type for voltage or current boost. |
| BTYPE? | Returns the amplifier types set for voltage and current boost. |
| CLOCK | Sets the clock/calendar. |
| CLOCK? | Returns the setting of the clock/calendar. |
| CUR_POST | Selects active binding post for current output. |
| CUR_POST? | Returns active binding post for current output. |
| EXTGUARD | Opens and closes an internal connection. between GUARD and LO. |
| EXTSENSE | Opens and closes an internal connection between SENSE and OUTPUT. |
| FORMAT | Restores calibration constants and other parameters to factory defaults. |
| LIMIT | Sets positive and negative output limits. |
| LIMIT? | Returns the programmed positive and negative output limits. |

## *Command Summary by Function (continued)*

| | |
|---|---|
| *LRN? | Returns a list of commands that can duplicate the present state. |
| RANGE? | Returns the present output range. |
| RANGELCK | Locks the present range, or selects autoranging. |
| **Output Commands** | |
| BOOST | Activates or deactivates an auxiliary amplifier. |
| DBMOUT? | Returns the output amplitude and frequency, but in dBm if ac V. |
| OPER | Activates the 5720A output if it is in standby. |
| OUT | Sets the output and establishes a new reference for error mode. |
| OUT? | Returns the output amplitude and frequency. |
| PHASE | Sets the phase shift of the phase output signal. |
| PHASE? | Returns the phase shift of the phase output signal. |
| PHASELCK | Activates or deactivates phase locking to an external signal. |
| PHASESFT | Activates or deactivates variable phase output. |
| RCOMP | Activates or deactivates two-wire compensation circuitry. |
| STBY | Puts the 5720A in standby. |
| VOUT? | Returns the output amplitude in volts if the active units are dBm. |
| WBAND | Activates or deactivates the Wideband AC Module (Option 5700A-03). |
| **General Functions** | |
| *CLS | Clear; clears status registers, any service request, and flags. |
| ECHO? | Echoes a string to the remote port. |
| GAL | Go to Alternate Language; enters Fluke 5100B or 5200A emulation mode. |
| *OPC | Sets bit 0 in the ESR to 1 when pending operations are complete. |

## *Command Summary by Function (continued)*

| | |
|---|---|
| *OPC? | Returns a "1" when all pending remote operations are complete. |
| *PUD | Stores a string of user-selected characters in non-volatile memory. |
| *PUD? | Returns the contents of the PUD memory. |
| RPT_STR | Loads the user report string. |
| RPT_STR? | Returns the user report string. |
| *RST | Resets the 5720A to its default power-up state. |
| UNCERT? | Returns the absolute uncertainty of the output. |
| *WAI | Halts program execution until pending operations are complete. |
| **RS-232C Interface Parameter Setting Commands** | |
| SP_EOF | Sets the End-of-File (EOF) string. |
| SP_EOF? | Returns the End-of-File (EOF) string. |
| SP_SET | Sets RS-232C interface parameters. |
| SP_SET? | Returns RS-232C interface parameters. |
| SP_TIME | Sets the time-out period. |
| SP_TIME? | Returns the time-out period. |
| **5720A Calibration, Testing, and Diagnostics Commands** | |
| CAL_ADJ | Does the internal portion of calibration. |
| CAL_CHK | Starts a calibration check. |
| CAL_CLST? | Returns a group of calibration constant names and their values. |
| CAL_CONF | Sets the specification confidence level to 95% or 99%. |
| CAL_CONF? | Returns the active calibration confidence level. |
| CAL_CONST? | Returns the value of a particular constant. |
| CAL_DATE? | Returns the date of the most recent calibration. |
| CAL_DAYS? | Returns number of days since last calibration recall. |
| CAL_INTV | Sets the calibration interval. |
| CAL_INTV? | Returns the calibration interval. |

## *Command Summary by Function (continued)*

| | |
|---|---|
| CAL_PR | Prints a calibration report out the serial interface. |
| CAL_REF | Performs a calibration procedure using a 1½, 10 k½, or 10V standard. |
| CAL_RNG | Starts a self calibration procedure of a range. |
| CAL_RPT? | Returns a formatted calibration report. |
| CAL_SHIFT? | Returns the shift of a range due to calibration. |
| CAL_SLST? | Returns the shifts of a group of ranges. |
| CAL_STORE | Stores new calibration constants in nonvolatile memory. |
| CAL_TEMP | Sets the temperature for calibration. |
| CAL_TEMP? | Returns the calibration temperature last specified. |
| CAL_WBFLAT | Performs Wideband AC Module (Option 5700A-03) flatness calibration. |
| CAL_WBGAIN | Performs Wideband AC Module (Option 5700A-03) gain calibration. |
| CAL_ZERO | Performs internal zeros calibration. |
| DIAG | Runs self diagnostics. |
| DIAGFLT | Sets the 5720A response to faults in remote diagnostics. |
| DIAGFLT? | Returns the 5720A response to faults in remote diagnostics. |
| OHMSREF? | Returns a calculated resistance reference. |
| STOP_PR | Stops printing a report. |
| *TST? | Performs self tests and returns the results. |
| **Serial Only Remote Commands** | |
| LOCAL | Places the 5720A into the local state. |
| LOCKOUT | Places the 5720A into the local lockout state. |
| REMOTE | Places the 5720A into remote state. |
| **Status Commands** | |
| *ESE | Loads the Event Status Enable register. |
| *ESE? | Reads the Event Status Enable register. |

## *Command Summary by Function (continued)*

| | |
|---|---|
| *ESR? | Reads and clears the Event Status Register. |
| ETIME? | Returns the time power has been on. |
| EXPLAIN? | Returning a brief description of a fault code. |
| FAULT? | Returns the most recent fault code from the fault queue. |
| *IDN? | Returns 5720A identification information. |
| ISCE | Loads Instrument Status Change Enable Register. |
| ISCE? | Reads Instrument Status Change Enable Register. |
| ISCR? | Reads and clears the Instrument Status Change Register. |
| ISR? | Reads and clears the Instrument Status Register. |
| ONTIME? | Returns the time elapsed since power-up. |
| *OPT? | Returns a list of installed modules and attached amplifiers. |
| *SRE | Loads the Service Request Enable Register. |
| *SRE? | Reads the Service Request Enable Register. |
| STATE? | Returns the long term state of the 5720A. |
| *STB? | Returns the status byte. |

## *Commands*

| Command | Parameters | Response |
|---|---|---|
| ADJOUT? | None | 1. (Float) Amplitude<br>2. (String) Units<br>3. (Float) Frequency |
| BOOST | ON or OFF | None |
| BTYPE | VB5725,<br>VB5205,<br>VB5215,<br>IB5725,<br>or IB5220 | None |
| BTYPE? | None | 1. (String) VB <model number><br>2. (String) IB <model number> |
| CAL_ADJ | None | None |
| CAL_CHK | None | None |
| CAL_CLST? | CAL,<br>CHECK,<br>or PREV | 1. (String) List (See manual.) |
| CAL_CONF | 99 or 95 | None |
| CAL_CONF? | None | CONF99 or CONF95 |
| CAL_CONST? | 1. CAL,<br>CHECK<br>PREV<br>2. Name of<br>constant | (Float) Value of the constant |
| CAL_DATE? | B5725,<br>CAL,<br>WBFLAT,<br>WBGAIN, or<br>ZERO | (Integer) Date as MMDDYY |

***Commands (continued)***

| Command | Parameters | Response |
|---|---|---|
| CAL_DAYS? | B5725, CAL, WBFLAT, WBGAIN, or ZERO | (Integer) # of elapsed days since calibration |
| CAL_INTV | 1, 90, 180, or 365 | None |
| CAL_INTV? | None | (Integer) 1,90, 180, or 365 |
| CAL_PR | CAL, CHECK, or RAW | None |
| CAL_REF | Value and units of external standard | None |
| CAL_RNG | 1. range identifier, NULL or STORE<br>2. Calibration magnitude (Only if 1 is range id)<br>3. Frequency (Optional, and only if 1 is range id) | None |
| CAL_RPT? | CAL, CHECK, or RAW | 1. (String) Formatted report |
| CAL_SHIFT? | 1. CAL or CHECK<br>2. Range identifier | 1. (String) Range info. (See manual.) |
| CAL_SLST? | CAL or CHECK | 1. (String) Info. for all ranges. (See manual.) |
| CAL_STORE | None | None |
| CAL_TEMP | Temperature in °C | None |
| CAL_TEMP? | B5725, CAL, WBFLAT, WBGAIN, or CHECK | (Float) Temperature in °C. |

***Commands (continued)***

| Command | Parameters | Response |
|---|---|---|
| CAL_WBFLAT | START, NULL, or STORE | None |
| CAL_WBGAIN | PGAIN, NGAIN, or STORE | None |
| CAL_ZERO | None | None |
| CLOCK | 1. 24-hour time as HHMMSS<br>2. Date as MMDDYY | None |
| CLOCK? | None | 1. (Integer) Time as HHMMSS<br>2. (Integer) Date as MMDDYY |
| *CLS | None | None |
| CUR_POST | NORMAL, AUX, or IB5725 | None |
| CUR_POST? | None | (String) NORMAL, AUX, or IB5725 |
| DBMOUT? | None | 1. (Float) Output value<br>2. (String) Units<br>3. (Float)Frequency |
| DIAG | ALL, D5700, DV5725, DI5725, CONT, or ABORT | None |

## *Commands (continued)*

| Command | Parameters | Response |
|---|---|---|
| DIAGFLT | HALT, ABORT, or CONT | None |
| DIAGFLT? | None | (String) HALT, ABORT, or CONT |
| ECHO? | Any string | (String) Same string |
| *ESE | Decimal equiv. of 16-bit word (0-255 only) | None |
| *ESE? | None | (Integer) Decimal equiv. of byte |
| *ESR? | None | (Integer) Decimal equiv. of byte |
| ETIME? | None | (Integer) minutes powered on |
| EXPLAIN? | Fault code | (String) Explanation text |
| EXTGUARD | ON or OFF | None |
| EXTSENSE | ON or OFF | None |
| FAULT? | None | (Integer) The fault code |
| FORMAT | ALL, B5725, CAL, RNG, or SETUP | None |
| GAL | L5100 | None |
| *IDN? | None | (String, string, string, string) Fluke, model #, serial #, main CPU s/w rev.+ inguard CPU s/w rev.+ BOOST CPU s/w rev.) |

## *Commands (continued)*

| Command | Parameters | Response |
|---|---|---|
| INCR | ± step size | None |
| ISCE | Decimal equivalent of 16-bit word | None |
| ISCE? | None | Decimal equivalent of 16-bit word |
| ISCR? | None | Decimal equivalent of 16-bit word |
| ISR? | None | Decimal equivalent of 16-bit word |
| LIMIT | 1. Positive limit with unit<br>2. Negative limit with unit | None |
| LIMIT? | None | (Float, float, float, float)<br>1. Positive voltage limit<br>2. Negative voltage limit<br>3. Positive current limit<br>4. Negative current limit |
| LOCAL | None | None |
| LOCKOUT | None | None |
| *LRN? | None | (String) Re-configuration command |
| MULT | Multiplier expressed as a floating point number | None |
| NEWREF | None | None |
| OFFSET | ON or OFF | None |
| OFFSET? | None | 1. (Float) Offset value<br>2. (Float) Offset units |

## *Commands (continued)*

| Command | Parameters | Response |
|---|---|---|
| OHMSREF? | CAL, CHECK, or PREV | (Float) Resistance reference |
| OLDREF | None | None |
| ONTIME? | None | (Integer) Time unit is powered on (minutes) |
| *OPC | None | None |
| *OPC? | None | (Integer) 1 |
| OPER | None | None |
| *OPT? | None | (Strings separated by commas) |
| OUT | Either one of the following is required.<br>1. (Optional) Amplitude<br>or<br>2. (Optional) Frequency | None |
| OUT? | None | 1. (Float) Amplitude<br>2. (String) Units<br>3. (Float) Frequency |
| OUT_ERR? | None | 1. (Float) UUT error magnitude<br>2. (String) Units for above |
| PHASE | ± phase in degrees | None |
| PHASE? | None | (Integer) Phase in degrees |
| PHASELCK | ON or OFF | None |
| PHASESFT | ON or OFF | None |

## *Commands (continued)*

| Command | Parameters | Response |
|---|---|---|
| *PUD | (See manual for parameter.) | None |
| *PUD? | None | (See manual for response.) |
| RANGE? | None | (String) Name of range |
| RANGELCK | ON or OFF | None |
| RCOMP | ON or OFF | None |
| REFOUT? | None | 1. (Float) Output<br>2. (String) Units<br>3. (String) Frequency |
| REMOTE | None | None |
| RPT_STR | String of up to 40 char. | None |
| RPT_STR? | None | (String) User report string |
| *RST | None | None |
| SCALE | ON or OFF | None |
| SCALE? | None | 1. (Float) Nominal full-scale<br>2. (Float) Actual full-scale<br>3. (String) Units for above two |
| SCAL_ERR? | None | 1. (Float) Scale error<br>2. (String) Units for scale error |

***Commands (continued)***

| Command | Parameters | Response |
|---|---|---|
| SP_EOF | 1. First ASCII code<br>2. Second ASCII code | None |
| SP_EOF? | None | 1. (Integer) First ASCII code<br>2. (Integer) Second ASCII code |
| SP_SET | 1. 110, 300, 600,1200, 2400, 4800, (9600), or 19200<br>2. (TERM) or COMP<br>3. (XON), RTS, or NOSTALL<br>4. DBIT7 or (DBIT8)<br>5. (SBIT1) or SBIT2<br>6. PNONE, (PEVEN), PODD, or PIGNORE<br>7. CR, LF, or (CRLF) | None |

## *Commands (continued)*

| Command | Parameters | Response |
|---|---|---|
| SP_SET? | None | 1. (Integer) Baud rate<br>2. (String) TERM or COMP<br>3. (String) XON, RTS, or NOSTALL<br>4. (String) DBIT7 or DBIT8<br>5. (String) SBIT1 or SBIT2<br>6. (String) PNONE, PEVEN, PODD, or PIGNORE<br>7. (String) CR, LF, or CRLF |
| SP_TIME | 0 - 30 | None |
| SP_TIME? | None | (Integer) 0 - 30, seconds |
| *SRE | Decimal equiv. of byte | None |
| *SRE? | None | Decimal equivalent of byte |
| STATE? | None | (See manual for response.) |
| *STB? | None | Decimal equivalent of byte |
| STBY | None | None |
| STOP_PR | None | None |
| *TST? | None | (Integer) 0, pass; 1, fail |

## *Commands (continued)*

| Command | Parameters | Response |
|---|---|---|
| UNCERT? | None | 1. (Float) 5720A uncertainty<br>2. (String) Units for response 1<br>3. (Integer) Cal interval in days |
| VOUT? | None | 1. (Float) amplitude<br>2. (String) Units<br>3. (Float) Frequency |
| *WAI | None | None |
| WBAND | ON or OFF | None |

## *Operating State Transitions*

| From | To | Use | 1722A GPIB Command | Serial Command |
|---|---|---|---|---|
| Local | Remote | MLA + REN | REMOTE | REMOTE |
| | Local/ Lockout | LLO + PEN | LOCKOUT | LOCKOUT |
| Remote | Local | GTL, or "GO TO LOCAL CONTROL" softkey | LOCAL | LOCAL |
| | Remote/ Lockout | LLO + REN | LOCKOUT | LOCKOUT |
| Local/ Lockout | Remote/ Lockout | MLA + REN | REMOTE or any 5720A command | REMOTE |
| Remote/ Lockout | Local | REN not | LOCAL | LOCAL |
| | Local/ Lockout | GTL | Manually using WBYTE | None |

## *Status Register Summary*

| Register | Read Command | Write Command | Enable Register |
|---|---|---|---|
| Serial Poll Status Byte (STB) | STB? (or SPL () for 1722A) | None | SRE |
| Service Request Enable Register (SRE) | *SRE? | *SRE | None |
| Event Status Register (ESR) | *ESR? | None | ESE |
| Event Status Enable Register (ESE) | *ESE? | *ESE | None |
| Instrument Status Register (ISR) | ISR? | None | None |
| Instrument Status Change Register (ISCR) | ISCR? | None | ISCE |
| Instrument Status Change Enable Register (ISCE | ISCE? | ISCE | None |

## *Status Register Summary (continued)*

### *Serial Poll Status Byte and SRE Bit Definitions*

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| 0 | RQS | ESB | MAV | EAV | ISCB | 0 | 0 |
| | MSS | | | | | | |

**RQS** For IEEE-488 remote control: Requesting service. The RQS bit is set to 1 whenever bits ESB, MAV, EAV, or ISCB change from 0 to 1 and are enabled (1) in the SRE. When RQS is 1, the 5720A asserts the SRQ control line. Perform a serial poll to read this bit to see if the 5720A is the source of an SRQ. (A serial poll also clears the RQS bit.)

**MSS** For serial remote control: Master summary status. Set to 1 whenever bits ESB, MAV, EAV, or ISCB are 1 and enabled (1) in the SRE. This bit can be read using the *STB? command.

**ESB** Is set to 1 when one or more enabled ESR bits are 1.

**MAV** Message available. The MAV bit is set to 1 whenever data is available in the 5720A's IEEE-488 interface output buffer.

**EAV** Error (fault) available. A fault has occurred and a fault code is available to be read from the fault queue by using the FAULT? query.

**ISCB** One or more enabled ISCR bits are 1.

## *Status Register Summary (continued)*

### *ESR and ESE Bit Definitions*

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| PON | 0 | CME | EXE | DDE | QYE | 0 | OPC |

**PON** Power on. This bit is set to 1 if the power has been cycled since the last time the ESR was read.

**CME** Command error (fault). The IEEE-488 interface encountered an incorrectly formed command.(The command FAULT? fetches the earliest fault code in the fault queue, which contains codes for the first 15 faults)

**EXE** Execution error (fault). A fault occurred while the 5720A tried to execute the last command. This could be caused, for example, by a parameter being out of range. (The command FAULT? fetches the earliest fault in the fault queue, which contains codes for the first 15 faults that have occurred.)

**DDE** Device-dependent error (fault). A fault related to a device-dependent command has occurred. An example would be attempting to execute "OUT 1000000V", which is outside the range of the 5720A. (The command FAULT? fetches the earliest fault in the fault queue, which contains codes for the first 15 faults that have occurred.)

**QYE** Query error (fault). The 5720A was addressed to talk when no response data was available or appropriate, or when the controller failed to retrieve data on the output queue.

**OPC** Operation complete. All commands previous to reception of a *OPC command have been executed, and the interface is ready to accept another message.

## *Status Register Summary (continued)*

### *ISR, ISCR, and ISCE Bit Definitions*

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
|---|---|---|---|---|---|---|---|
| 0 | 0 | RPTBUSY | SETTLED | REMOTE | WBND | SCALE | OFFSET |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| PLOCK | PSHFT | RLOCK | RCOMP | BOOST | EXSENS | EXGARD | OPER |

**RPTBUSY** When 1, A calibration report is being printed to the serial port.

**SETTLED** When 1, the output has stabilized to within specification.

**REMOTE** When 1, the 5720A is under remote control.

**WBND** When 1, wideband is active.

**SCALE** When 1, scaling is active.

**OFFSET** When 1, an offset is active.

**PLOCK** When 1, the 5720A output is phase locked to an external source.

**PSHFT** When 1, variable phase output is active.

**RLOCK** When 1, the 5720A output range is locked.

**RCOMP** When 1, two-wire compensation is active when in resistance mode.

**BOOST** When 1, an auxiliary amplifier is active.

**EXSENS** When 1, external sensing is selected.

**EXGARD** When 1, external voltage guard is selected.

**OPER** When 1, the 5720A is operating. When 0, it is in standby.

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